Apprentices and other trainees usually start out earning about half of what an experienced worker earns, though their wage rate increases as they advance through the training program.

Some carpet installers, floor layers, and tilesetters belong to the United Brotherhood of Carpenters and Joiners of America. Some tilesetters also belong to the International Union of Bricklayers and Allied Craftsmen, while some carpet installers belong to the International Brotherhood of Painters and Allied Trades.

Related Occupations

Carpet, floor, and tile installers and finishers measure, cut, and fit materials to cover a space. Workers in other occupations involving similar skills but using different materials, include bricklayers, carpenters, cement masons, concrete finishers, drywall installers and finishers, marblesetters, painters and paperhangers, roofers, sheet-metal workers, stonemasons, and terrazzo workers.

Sources of Additional Information

For details about apprenticeships or work opportunities, contact local flooring or tilesetting contractors or retailers; locals of the unions previously mentioned; or the nearest office of the State apprenticeship agency or the State employment service.

For general information about the work of carpet installers and floor layers, contact:

☛ Floor Covering Installation Contractors Association, P.O. Box 948, Dalton, GA 30722-0948.

Additional information on training for carpet installers and floor layers is available from:

☛ International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, DC 20006.

For general information about the work of tilesetters and finishers, contact:

☛ International Union of Bricklayers and Allied Craftsmen, International Masonry Institute, Apprenticeship and Training, 815 15th St. NW., Washington, DC 20005.

For information concerning training of carpet installers, floor and tile setters, and finishers contact:

☛ United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, DC 20001.

Cement Masons, Concrete Finishers, and Terrazzo Workers

(O*NET 87311)

Significant Points

- Employment of cement masons, concrete finishers, and terrazzo workers will increase slowly as new technology makes these workers more productive.
- Most learn their trade on the job, either through formal 3-year apprenticeship programs or by working as helpers.
- Jobs are often outdoors and require a lot of bending and kneeling.

Nature of the Work

Cement masons, concrete finishers, and terrazzo workers all work with concrete, one of the most common and durable materials used in construction jobs. Once set, concrete—a mixture of Portland cement, sand, gravel, and water—becomes the foundation for everything from decorative patios and floors to huge dams or miles of roadways.

Cement masons place and finish the concrete. They may also color concrete surfaces, expose aggregate (small stones) in walls and sidewalks, or fabricate concrete beams, columns, and panels. In preparing a site for placing concrete, cement masons first set the forms for holding the concrete to the desired pitch and depth and properly align them. They then direct the casting of the concrete and supervise laborers who use shovels or special tools to spread it. Masons then guide a straightedge back and forth across the top of the forms to "screed," or level, the freshly placed concrete. Immediately after leveling the concrete, masons carefully smooth the concrete surface with a "bull float," a long-handled tool about 8 by 48 inches that covers the coarser materials in the concrete and brings a rich mixture of fine cement paste to the surface.

After the concrete has been leveled and floated, *concrete finishers* press an edger between the forms and the concrete and guide it along the edge and the surface. This produces slightly rounded edges and helps prevent chipping or cracking. They use a special tool called a "groover" to make joints or grooves at specific intervals that help control cracking. Next, finishers trowel the surface using either a powered or a hand trowel, a small, smooth, rectangular metal tool.

Sometimes, cement masons perform all steps of laying concrete, including the finishing. As the final step, masons retrowel the concrete surface back and forth with powered and hand trowels to create a smooth finish. For a coarse, nonskid finish, masons brush the surface with a broom or stiff-bristled brush. For a pebble finish, they embed small gravel chips into the surface. They then wash any excess cement from the exposed chips with a mild acid solution. For color, they use colored premixed concrete. On concrete surfaces that will remain exposed after forms are stripped, such as columns, ceilings, and wall panels, cement masons cut away high spots and loose concrete with hammer and chisel, fill any large indentations with a Portland cement paste and smooth the surface with a rubbing carborundum stone. Finally, they coat the exposed area with a rich Portland cement mixture using either a special tool or a coarse cloth to rub the concrete to a uniform finish.

Throughout the entire process cement masons must monitor how the wind, heat, or cold effects the curing of the concrete. They must have a thorough knowledge of concrete characteristics so that by using sight and touch they can determine what is happening to the concrete and take measures to prevent defects.

Terrazzo workers create attractive walkways, floors, patios, and panels by exposing marble chips and other fine aggregates on the surface of finished concrete. Much of the preliminary work of terrazzo workers is similar to that of cement masons.

When laying sidewalks, concrete masons carefully smooth the surface.

Attractive, marble-chip terrazzo requires three layers of materials. First, cement masons or terrazzo workers build a solid, level concrete foundation that is 3 to 4 inches deep. After the forms are removed from the foundation, workers add a 1-inch layer of sandy concrete. Before this layer sets, terrazzo workers partially embed metal divider strips into the concrete wherever there is to be a joint or change of color in the terrazzo. These strips separate the different designs and colors of the terrazzo panels and help prevent cracks. For the final layer, terrazzo workers blend and place into each of the panels a fine marble chip mixture that may be color-pigmented. They then hand trowel each panel until it is level with the tops of the ferrule strips. While the mixture is still wet, workers toss additional marble chips of various colors into each panel and roll a lightweight roller over the entire surface.

When the terrazzo is thoroughly dry, helpers grind it with a terrazzo grinder, which is somewhat like a floor polisher, only much heavier. Slight depressions left by the grinding are filled with a matching grout material and hand troweled for a smooth, uniform surface. Terrazzo workers then clean, polish, and seal the dry surface for a lustrous finish.

Working Conditions

Concrete or terrazzo work is fast-paced and strenuous and requires continuous physical effort. Because most finishing is done at floor level, workers must bend and kneel a lot. Many jobs are outdoors and work is generally halted during inclement weather. The work, either indoor or outdoor, may be in areas that are muddy, dusty, and dirty. To avoid chemical burns from uncured concrete and sore knees from frequent kneeling, many workers wear kneepads. Workers usually wear water-repellent boots while working in wet concrete.

Employment

Cement masons, concrete finishers, and terrazzo workers held about 139,000 jobs in 1998; terrazzo workers accounted for a very small proportion of the total. Most cement masons and concrete finishers worked for concrete contractors or for general contractors on projects such as highways, bridges, shopping malls, or large buildings such as factories, schools, and hospitals. A small number were employed by firms that manufacture concrete products. Most terrazzo workers worked for special trade contractors who install decorative floors and wall panels.

Only about 1 out of 20 cement masons, concrete finishers, and terrazzo workers was self-employed, a smaller proportion than in other building trades. Most self-employed masons specialized in small jobs, such as driveways, sidewalks, and patios.

Training, Other Qualifications, and Advancement

Cement masons, concrete finishers, and terrazzo workers learn their trades either through on-the-job training as helpers, by attending trade or vocational/technical schools, or through 3-year apprenticeship programs. Many masons and finishers first gain experience as construction laborers.

When hiring helpers and apprentices, employers prefer high school graduates who are at least 18 years old and in good physical condition and who have a driver's license. The ability to get along with others also is important because cement masons frequently work in teams. High school courses in general science, shop mathematics, blueprint reading, or mechanical drawing provide a helpful background.

On-the-job training programs consist of informal instruction from experienced workers in which helpers learn to use the tools, equipment, machines, and materials of the trade. They begin with tasks such as edging and jointing and using a straightedge on freshly placed concrete. As they progress, assignments become more complex, and trainees can usually do finishing work within a short time.

Three-year apprenticeship programs, usually jointly sponsored by local unions and contractors, provide on-the-job training in addition to a recommended minimum of 144 hours of classroom instruction each year. A written test and a physical exam may be required. In the classroom, apprentices learn applied mathematics, blueprint reading, and safety. Apprentices generally receive special instruction in layout work and cost estimating.

Cement masons, concrete finishers, and terrazzo workers should enjoy doing demanding work. They should have pride of craftsmanship and be able to work without close supervision.

Experienced cement masons, concrete finishers, or terrazzo workers may advance to become supervisors or contract estimators. Some open their own concrete businesses.

Job Outlook

Employment of cement masons, concrete finishers, and terrazzo workers is expected to grow more slowly than the average for all occupations through the year 2008. In addition to job openings that will stem from the rising demand for the services of these workers, other openings will become available as experienced workers transfer to other occupations or leave the labor force.

The demand for cement masons, concrete finishers, and terrazzo workers will rise as the population and the economy grow. They will be needed to build highways, bridges, subways, factories, office buildings, hotels, shopping centers, schools, hospitals, and other structures. In addition, the increasing use of concrete as a building material—particularly in nonresidential construction—will add to the demand. More cement masons also will be needed to repair and renovate existing highways, bridges, and other structures.

Employment growth of cement masons, concrete finishers, and terrazzo workers, however, will not keep pace with the growth of these construction projects. Workers' productivity will increase through use of improved concrete pumping systems, continuous concrete mixers, quicker setting cement, troweling machines, prefabricated masonry systems, and other improved materials, equipment, and tools.

Despite expected slow job growth, opportunities for skilled cement masons, concrete finishers, and terrazzo workers are expected to be excellent as the increase in demand outpaces the supply of workers trained in this craft. The pool of young workers, particularly those between the ages of 16 and 24, available to enter training programs will also increase slowly, and many in that group will be reluctant to seek training for jobs that may be strenuous and have uncomfortable working conditions.

Employment of cement masons, concrete finishers, and terrazzo workers, like that of many other workers, is sensitive to the fluctuations of the economy. Workers in these trades may experience periods of unemployment when the level of nonresidential construction falls. On the other hand, shortages of these workers may occur in some areas during peak periods of building activity.

Earnings

In 1998, the median hourly earnings of cement masons, concrete finishers, and terrazzo workers were $12.39. The middle 50 percent earned between $9.99 and $16.65. The top 10 percent earned over $22.04 and the bottom 10 percent earned less that $7.92. Median hourly earnings in the industries employing the largest numbers of cement masons, concrete finishers, and terrazzo workers in 1997 are shown below:

Highway and street construction	$12.80
Concrete work	12.40
Heavy construction, except highway	12.30
Nonresidential building construction	11.40
Miscellaneous special trade contractors	11.20

Earnings for workers in these trades may be reduced on occasion, because poor weather and downturns in construction activity limit the time they can work. Cement masons often work overtime, with premium pay, because once concrete has been placed, the job must be completed.

Many cement masons, concrete finishers, and terrazzo workers belong to the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or to the International

Union of Bricklayers and Allied Craftsmen. Some terrazzo workers belong to the United Brotherhood of Carpenters and Joiners of the United States. According to the limited information available, average hourly earnings—including benefits—for cement masons who belonged to a union and worked full time, ranged between $15.40 and $46.80 in 1998. Cement masons in New York, Boston, San Francisco, Chicago, Los Angeles, Philadelphia, and other large cities received the highest wages. Nonunion workers generally have lower wage rates than union workers. Apprentices usually start at 50 to 60 percent of the rate paid to experienced workers.

Related Occupations
Cement masons, concrete finishers, and terrazzo workers combine skill with knowledge of building materials to construct buildings, highways, and other structures. Other occupations involving similar skills and knowledge include bricklayers, form builders, marble setters, plasterers, stonemasons, and tilesetters.

Sources of Additional Information
For information about apprenticeships and work opportunities, contact local concrete or terrazzo contractors; locals of unions previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about cement masons, concrete finishers, and terrazzo workers, contact:

- Associated General Contractors of America, Inc., 1957 E St. NW., Washington, DC 20006.
- International Union of Bricklayers and Allied Craftsmen, International Masonry Institute Apprenticeship and Training, 815 15th St. NW., Suite 1001, Washington, DC 20005.
- Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 14405 Laurel Place, Suite 300, Laurel, MD 20707.
- National Terrazzo and Mosaic Association, 101 E. Market St., Suite 2004, Leesburg, VA 20176-3122.
- Portland Cement Association, 5420 Old Orchard Rd., Skokie, IL 60077.
- United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, DC 20001.

Construction Equipment Operators

(O*NET 87708, 97938, and 97956)

Significant Points

- Most acquire their skills on the job, but some construction equipment operators complete formal apprenticeship programs.
- Employment is expected to grow slowly due to slow overall growth in the construction industries.
- Workers in these occupations often have high pay rates, but many cannot work in inclement weather, thus reducing earnings.

Nature of the Work
Construction equipment operators use machinery to move construction materials, earth, and other heavy materials and to apply asphalt and concrete to roads and other substructures. Operators control equipment by moving levers or foot pedals, operating switches, or turning dials. The operation of much of this equipment is becoming more complex as a result of computerized controls. Construction equipment operators may also set up and inspect equipment, make adjustments, and perform minor repairs.

Construction equipment operators include grader, bulldozer, and scraper operators, operating engineers, and paving, surfacing, and tamping equipment operators. *Grader, bulldozer, and scraper operators* gouge out, distribute, level, and grade earth with vehicles equipped with a concave blade attached across the front. In addition to the familiar bulldozers, they operate trench excavators, road graders, and similar equipment. Operators maneuver the equipment in successive passes to raise or lower terrain to a specific grade. They may uproot trees and move large rocks while preparing the surface.

Operating engineers are unique in that they operate several different types of power construction equipment such as cranes, derricks, shovels, tractors, scrapers, pumps and hoists. They may operate cranes and derricks that lift materials, machinery, or other heavy objects from the ground. They extend or retract a horizontally mounted boom to lower, or raise a hook attached to the loadline, often in response to hand signals and radioed instructions from other workers. They also may operate excavation and loading machines equipped with scoops, shovels, or buckets that dig sand, gravel, earth, or similar materials and load it into trucks or onto conveyors. Sometimes they may drive and control industrial trucks or tractors equipped with a forklift or boom for lifting materials or hitches for pulling trailers. They also may operate and maintain air compressors, pumps, and other power equipment at construction work sites.

Paving and surfacing equipment operators use levers and other controls to operate machines that spread and level asphalt or spread and smooth concrete for roadways or other substructures. *Asphalt paving machine operators* turn valves to regulate the temperature and flow of asphalt onto the roadbed. They must watch that the machine distributes the paving material evenly and without voids and make sure there is a constant flow of asphalt going into the hopper. *Concrete paving machine operators* move levers and turn handwheels to lower an attachment that spreads, vibrates, and levels wet concrete within forms. They must observe the surface of concrete to point out low spots for workers to add concrete. They use other attachments to the machine to float the surface of the concrete, spray on a curing compound, and cut expansion joints. *Tamping equipment operators* operate tamping machines that compact earth and other fill materials for roadbeds. They also may operate machines with interchangeable hammers to cut or break up old pavement and drive guardrail posts into earth.

Working Conditions
Many construction equipment operators work outdoors, in nearly every type of climate and weather condition. Some machines, including bulldozers, scrapers, and particularly tampers, are noisy and shake or jolt the operator. As with most machinery, accidents generally can be avoided by observing proper operating procedures and safety practices.

Many construction equipment operators work outdoors in hot and cold weather and sometimes in rain or snow.